

WHAT IS CLAIMED IS:

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1 A tire condition monitoring apparatus for monitoring a condition of a tire attached to a vehicle, the apparatus comprising:

5 a transmitter, which is operated by a battery and detects at least the temperature in the tire and a voltage-related value that varies in accordance with voltage of the battery; and

10 10 a controller, which judges whether or not the life of the battery is ending depending on the voltage-related value, wherein the judgment regarding the life of the battery is performed in accordance with the temperature in the tire.

15 15 2. The apparatus as set forth in claim 1, wherein the transmitter wirelessly transmits data, which includes data that represents the temperature in the tire and data that represents the voltage-related value, and the controller is located in a receiver that receives the data from the transmitter.

20 20 3. The apparatus as set forth in claim 1, wherein the controller judges whether or not the life of the battery is ending based on a comparison between the voltage-related value and a variable voltage reference value that is selected in accordance with the temperature in the tire.

25 25 4. The apparatus as set forth in claim 3, wherein the controller determines the voltage reference value using a functional equation that represents variation of the voltage of the battery with respect to the ambient temperature to which the battery is exposed.

30 30 5. The apparatus as set forth in claim 1, wherein the

controller judges whether or not the life of the battery is ending based on a comparison between the voltage-related value and a predetermined, constant voltage reference value if the temperature in the tire is equal to or greater than a 5 predetermined reference value, and the controller does not perform the judgment regarding the life of the battery if the temperature in the tire is smaller than the reference value.

6. The apparatus as set forth in claim 3, wherein the
10 controller determines that the life of the battery is ending if the voltage-related value has been repeatedly judged to be smaller than the voltage reference value in consecutive judgment cycles.

15 7. The apparatus as set forth in claim 5, wherein the controller determines that the life of the battery is ending if the voltage-related value has been repeatedly judged to be smaller than the voltage reference value in consecutive judgment cycles.

20 8. The apparatus as set forth in claim 1, wherein the voltage-related value is the voltage of the battery or a resistance in an electric circuit of the transmitter.

25 9. A tire condition monitoring apparatus for monitoring a condition of a tire attached to a vehicle, the apparatus comprising:

a transmitter, which is operated by a battery and wirelessly transmits data, wherein the data includes at least 30 data that represents the temperature in the tire and data that represents voltage of the battery; and

a receiver, which receives the data from the transmitter, wherein the receiver includes a controller that judges whether or not the life of the battery is ending

depending on the voltage of the battery, which is derived from the received data, wherein the judgment regarding the life of the battery is performed in accordance with the temperature in the tire, which is derived from the received
5 data.

10. The apparatus as set forth in claim 9, wherein the controller judges whether or not the life of the battery is ending based on a comparison between the voltage of the
10 battery and a variable voltage reference value that is selected in accordance with the temperature in the tire.

15. The apparatus as set forth in claim 10, wherein the controller determines the voltage reference value using a functional equation that represents variation of the voltage of the battery with respect to the ambient temperature to which the battery is exposed.

20. The apparatus as set forth in claim 9, wherein the controller judges whether or not the life of the battery is ending based on a comparison between the voltage of the
battery and a predetermined, constant voltage reference value if the temperature in the tire is equal to or greater than a predetermined reference value, and the controller does not
25 perform the judgment regarding the life of the battery if the temperature in the tire is smaller than the reference value.

30. The apparatus as set forth in claim 10, wherein the controller determines that the life of the battery is ending if the voltage of the battery has been repeatedly judged to be smaller than the voltage reference value in consecutive judgment cycles.

14. The apparatus as set forth in claim 12, wherein the

controller determines that the life of the battery is ending if the voltage of the battery has been repeatedly judged to be smaller than the voltage reference value in consecutive judgment cycles.

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15. A tire condition monitoring apparatus for monitoring a condition of a tire attached to a vehicle, the apparatus comprising:

10 a transmitter, which is operated by a battery and includes:

 a temperature sensor, which detects the temperature in the tire;

 a voltage sensor, which detects the voltage of the battery; and

15 a transmitting circuit, which wirelessly transmits data including data that represents the detected temperature and data that represents the detected voltage; and

20 a receiver, which receives the data from the transmitter, wherein the receiver includes a controller that judges whether or not the life of the battery is ending based on a comparison between the voltage of the battery, which is derived from the received data, and a variable voltage reference value that is selected in accordance with the temperature in the tire, which is derived from the received data.